appropriate.

[0295] Referring to Fig. 4, at step S30, the operator executes a numerical program on a screen of the monitor 38. If a numerical execution command is ordered, a menu for selecting a numerical recipe name on an initial screen is provided to thereby enable the operator to select a desired recipe name. Similar to step S10, the numerical recipe includes information such as a storage directory of image files to be numerated, an area and a position of the numerical target zone, a threshold value, and information on a directory in which the image files are to be re-stored. The operator selects an image file to be numerated among the recipe files. The computer 36 executes the numerical program in response to the operator's numerical execution command.

[0300] At step S32, the computer 36 reads out the data of the opened image files and provides it to the image processor 34, thereby displaying the SEM image on the monitor 38. For example, the SEM file as shown in Fig. 5 is displayed on the monitor 38.

[0305] Additionally, at step S34, a plurality of mesh lines 64a-64e and 66a-66e are formed for dividing the screen of the monitor 38 into a plurality of sub areas, in which the mesh lines are overlapped over the displayed image. The operator selects the numerical target zone using any suitable input device, such as a mouse (not shown), on the screen of the monitor 38 displaying the SEM image of the scanned OCS-type capacitor cell overlapped with the mesh lines.

[0310] At step S36, by monitoring the operator's selection, the computer 36 searches the image data corresponding to the selected numerical target zone of the image file stored in the memory. For example, if the 8 sub areas within the bold line 62 shown in Fig. 5 correspond to the operator selected numerical target zone, the

image data contained within the numerical target zone 62 are extracted from the image file using the coordinate data. According to this method, since the operator directly views the image displayed on the screen and selects the numerical target zone, the correctness of the selected numerical target zone may be more evident compared with the automatically selected first numerical algorithm. However, since the operator must directly select the numerical target zone, the degree of automation is decreased, and the time and effort involved in the process are increased.

[0315] At step S38, after extracting the image data of the numerical target zone, the smoothing process is performed with respect to the extracted image data, similar to step S16 previously described. Fig. 9A is an exemplary view of an image before performing a smoothing process, and Fig. 9B is an exemplary view of an image after performing a smoothing process.

[0320] At step S40, the standardization process is performed, similar to step S18. At step S42, the number of the pixels of the image data is counted, similar to step S20. Finally, at step S44, the growth degree of the HSGs is calculated, similar to step S22. Figs. 10A to 10C are exemplary views of images showing a calculated value of the growth degree of the HSGs and a growth state of the HSGs, respectively.

[0325] Figs. 11A to 11C are views showing the SEM images and the calculated growth degree of the HSGs, when the numerical algorithm is applied setting the threshold value to 121 during the growth of the OCS-type capacitor cell under a predetermined growth condition. When 60 seconds, 100 seconds and 140 seconds are elapsed in the growth time of the HSGs, it can be seen that the HSGs are grown by about 36%, 54% and 66%, respectively.

[0330] Figs. 12A and 12B are graphs showing the calculated results of the growth degree of the HSGs according to the measured position of the semiconductor wafer

and the growth time of the HSGs, respectively. In Figs. 12A and 12B, reference symbols T, L, C, R and F represent that the measured position of the SEM image is the top, the left, the bottom, the right, and a flat zone, respectively.

[0335] Although the above described algorithms can be installed in the computer 38 having the SEM and can be operated in off-line mode, it is also possible to perform the numerical process in on-line mode through other computers integrated with a local access network (LAN). For this, an on-line service function is only added to the numerical program.

[0340] Although the method for numerating the growth degree of the HSGs in manufacturing the OCS-type capacitor cell is described as an embodiment of the present invention, the present invention can also be applied to numerate the distribution degree of unevenness with respect to a surface of a specimen using an SEM image of the specimen.

[0345] As mentioned above, the growth degree of grains on the surface of the specimen, e.g., the semiconductor wafer, captured using the SEM can be automatically calculated through the program, not the operator's visible observation. Therefore, the analysis of the grain growth state can be achieved rapidly and accurately. As a result, the quality of devices is improved and the analysis time is reduced, thereby obtaining increased productivity.

[0350] While the present invention has been described in detail, it should be understood that various changes, substitutions and alterations could be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.